



EV Charging Overview

February 2010

Nissan North America

KEY CHARGING TERMS



- **Charger** – Device to change AC wall power into DC power for charging the battery. The charger is located on the vehicle.
- **EVSE** – Electric Vehicle Supply Equipment - provides AC wall power to the vehicle to be used by the on-board charger. This is the external hardware that is required to charge Electric Vehicles.
- **SAE J1772** – Society of Automotive Engineers (SAE) standard for conductive charging. Sets the industry wide standard for the charging connector and communications protocol.
- **Level 1 Charging** – 120 Volts, 12 Amps
- **Level 2 Charging** – 240 Volts, 15-30 Amps
- **Level 3 Charging** – 480 Volts, 100+ Amps, also known as DC Fast Charge



LEVEL 1, 2, AND 3 CHARGING



| Type | Power Supply | | Charger Power | Charging Level | Charger Location | Charging Time (24kwh Battery) |
|--------|------------------------|-----|---------------|----------------|------------------|-------------------------------|
| Normal | 120VAC Single Phase | 12A | 1.4kW | Level 1 | | 16h |
| | 240VAC Single Phase | 15A | 3.3kW | Level 2 | On-board | 8h |
| | | 30A | 6.6kW | | | 4h |
| Fast | 480VDC 3-phase | | 50kW | Level 3 | Off-board | 30min |



NISSAN LEAF CHARGE PORTS



Level 3 DC
Fast Charge



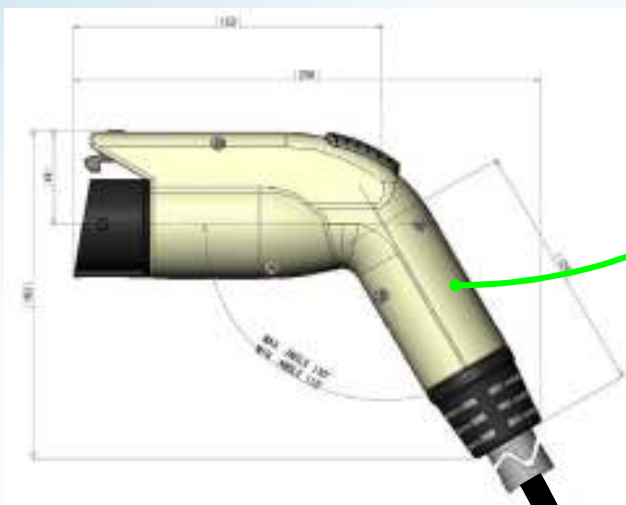
Level
1 & 2



LEVEL 1 CHARGING EXAMPLE (120V)



- SAE standard connector will be used
- Standard equipment – included with the Nissan Leaf



Vehicle coupler
(SAE J1772)

EVSE
(Safety device)

EVSE = Electric Vehicle Supply Equipment



LEVEL 2 CHARGING EXAMPLE (240V)



- SAE standardized connector will be used. Same connector as Level 1

Vehicle coupler
(SAE J1772)

Safety equipment
inside EVSE



LEVEL 2 CHARGING EXAMPLE (240V)



LEVEL 3 CHARGING EXAMPLES (FAST CHARGE)



- SAE standard has not been finalized for Level 3



Vehicle coupler
Not standardized



JARI
(Proposal)



Amphenol
(proposal)



INFRASTRUCTURE PROVIDERS



EVSE

Installation

Smart Grid



Clean Fuel Connection, Inc.



Zero Emission

Nissan Confidential



INFRASTRUCTURE PROVIDERS



- **Aerovironment** is Nissan's preferred supplier for Level 2 Home Charging Equipment. They will provide the home EVSE and installation services for Nissan's retail EV customers
- Nissan also has a partnership with **ETEC** to deploy home and public infrastructure as part of a Dept. of Energy Federal Grant program. For more information go to www.theEVproject.com

AEROVIRONMENT EVSE



Level 3



**Public Level 2 EVSE
with secured cable &
billing**



**Level 2 Wall
Mount**



PUBLIC INFRASTRUCTURE



Better Place
infrastructure
in California

Membership
is required to
use the
station

Coulomb Technologies
infrastructure in California



ECotality concept of
Fast Charging Station
at Retailer

Source : Better Place, Coulomb Technologies, ECotality



OTHER PROVIDERS - CLIPPER CREEK EVSE



120V version



Tesla version



OTHER PROVIDERS - COULOMB EVSE



**Pole/Wall
mount
version**

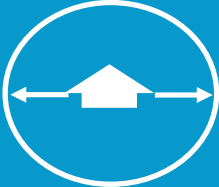
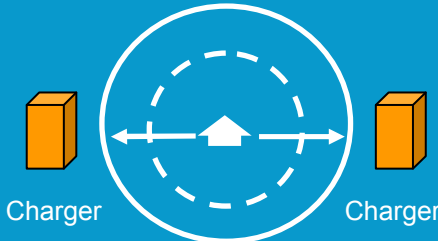
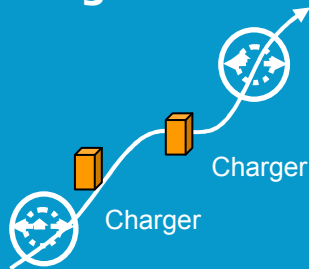


**Floor mount version - Live
demonstration with prototype
J1772 connector and adaptor
cable for Mini-e**



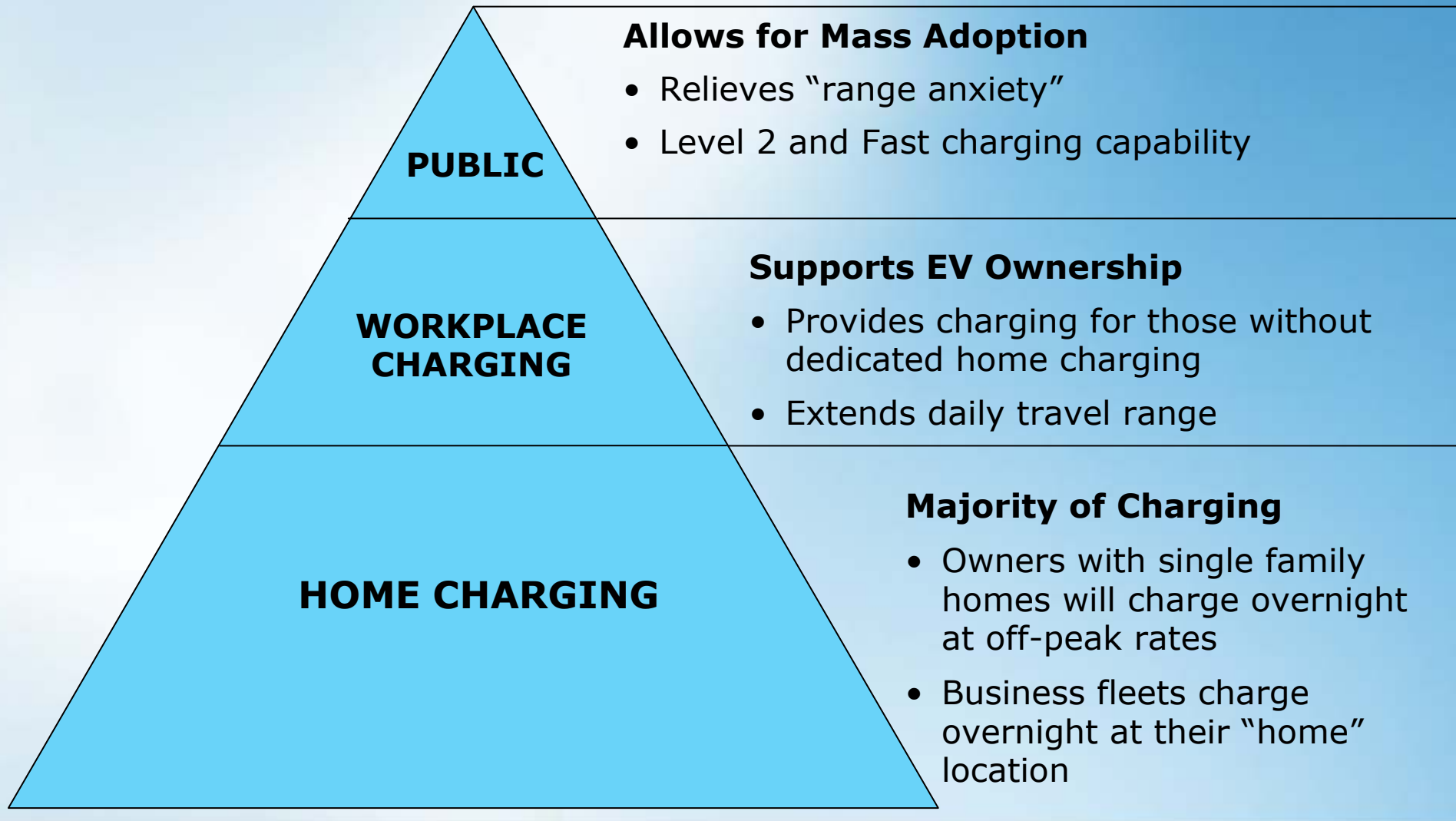
CHARGING NETWORK CONCEPT



| | | Charging Network | |
|---------------|--|---|---|
| | | Destination Charging | Pathway Charging |
| EV Usage | Home Charging Short Distance  | Mid Distance  | Long Distance  |
| Charger Type | Normal | Normal or Fast (depends on stay time) | Fast |
| | Level 2 | Level 2 or 3 | Level 3 |
| Charging Site | Home | Workplace, Movie Theatre, Mall, Restaurant, or Parking Lot | Major Roads & Highway Rest and Service Area |



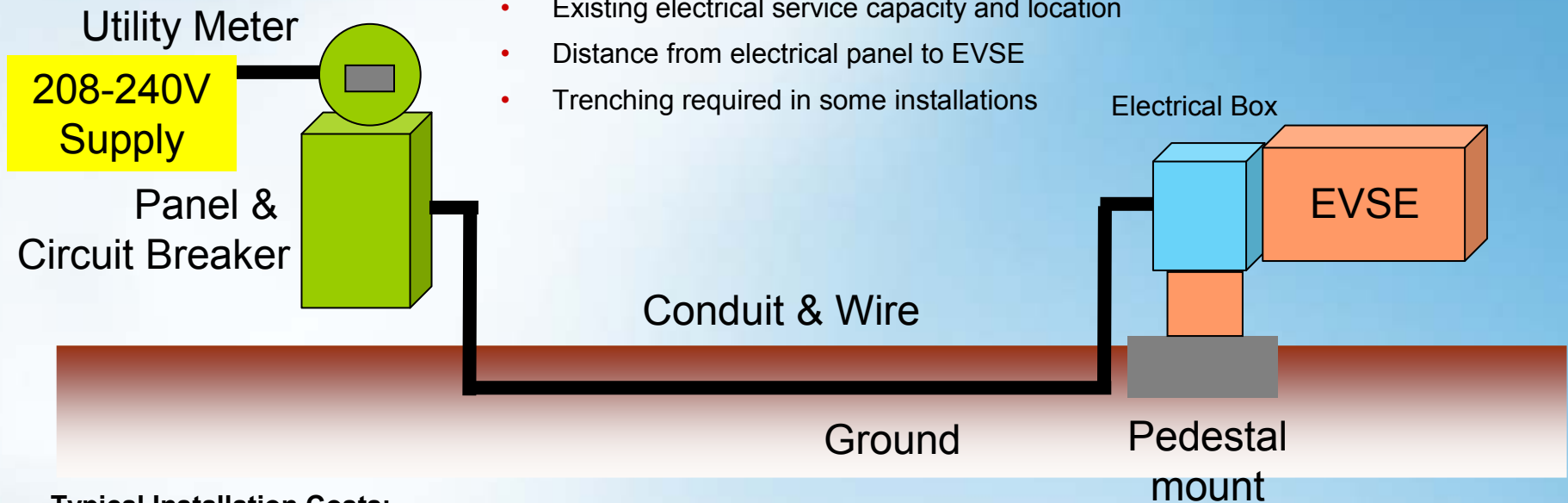
INFRASTRUCTURE ROLLOUT



COMMERCIAL EVSE INSTALLATION



- Level 2 EVSE
- 40A dedicated circuit
- Installation costs can vary greatly depending on:
 - Existing electrical service capacity and location
 - Distance from electrical panel to EVSE
 - Trenching required in some installations



Typical Installation Costs:

Breaker / Panel Upgrades

\$50 - \$725

Installation & Materials Cost

\$2000 - \$7775

Commercial Grade EVSE

\$1k - \$3k

TOTAL
\$3k - \$11k

Estimates based on discussions with EVSE suppliers



RESIDENTIAL EVSE INSTALLATION



- Level 2 EVSE
- Add a dedicated 40A circuit breaker
- Run conduit and wiring to EVSE box location (Garage, Carport, etc)
- Mount and hardwire the EVSE box



Breaker / Panel Upgrades

Installation & Materials Cost

EVSE

TBD

TBD

TBD

**TOTAL
TBD**

NNA HAS NOT YET RELEASED PRICING FOR L2 HOME EVSE



INFRASTRUCTURE INCENTIVES



Federal - Alternative Fuel Infrastructure Tax Credit

- Businesses can qualify for a tax credit of up to 50% of the cost of installing alternative fueling infrastructure
- Maximum tax credit is \$50,000 per location for equipment installed after Jan. 1, 2009
- Individual consumers qualify for \$2000 tax credit
- Credit expires on December 31, 2010
- For more information
 - Tax Form 8911 used to claim tax credit
 - Reference public law 111-5, Section 1123, and 26 U.S. Code 30C

State – Oregon

- BETC – Business Energy Tax Credit
- 35% of eligible project costs can be taken over 5 years
- For project costs of less than \$20,000 the entire credit can be taken in the first year
- RETC – Residential Energy Tax Credit, \$750 tax credit for consumers



FEDERAL STIMULUS FOR INFRASTRUCTURE



eTec Dept. of Energy Grant – FOA 28

- \$99.6M grant to deploy and study electric vehicle infrastructure
- eTec is award recipient and project administrator
- Public infrastructure to be deployed in 5 regions:
 - Oregon (Portland, Salem, Corvallis)
 - San Diego
 - Phoenix, Tucson
 - Seattle
 - Tennessee (Nashville, Knoxville, Chattanooga)
- Up to 1000 Nissan Leafs to be deployed in each region
- Volume deployed will be a mix of retail / fleet
- Participants who opt in to the program to receive free EVSE
- Participants agree to have infrastructure usage monitored for 2 year period
- More information and project partner list available at www.theEVproject.com





Thank You

